

# Southwest 2016 Potato Collecting Trip Report

Mogollon Rim (N border of Gila County), APA-GIL (Alpine), Mt Lemmon (Tucson)  
September 18-27, 2016

## Genebank participants:

John (JB) and Ingrid (IB) Bamberg, Alfonso del Rio (AdR), Charles "Chico" Fernandez (CF). All affiliations: US Potato Genebank (USPG), 4312 Hwy 42, Sturgeon Bay, WI, 54235. Collection prefix = BdRF numbers 322-347.

## 1. General Goals, Outcomes, and Observations:

Mogollon Rim lakes. Last year we were successful finding new *fendleri* sites in this area, extending the range to the NW. But road repairs prevented searching at Blue Reservoir and rain prevented searching at Knoll and Bear Canyon lakes. The Reservoir was still closed this year. We re-collected lost *jamesii* at 95-96 jct, and found a new *fendleri* population there. We found a third population of *fendleri* at Woods Canyon Lake along the N spur of the lake. We searched hard at Knoll and Bear Canyon without success, despite encountering habitat that looked very favorable. A relatively new herbarium report for Canyon Creek, about 5 miles SE of Willow Springs Lake was searched, resulting in collection of the *jamesii*, as reported by Makins et al. [2012], and also a new sympatric sample of *fendleri*.

Between Mogollon Rim and Eagar. We explored new sites and revisited known previous sites while traveling between locations. A new collection of *fendleri* was made at Bog Creek on the way to ShowLow as last reported by Bar over 50 years ago [1961]. Last year's report said, "In some sites where potatoes were abundant in 2014, they were surprisingly rare this year, for no apparent reason." This was again true in 2016. Most notably, we visited BAM05 [1995] at roadside pulloff just W of Heber, which always displays at least some robust plants whenever we have stopped, but this year we could find none. Similarly the abundant plants seen at Heber-Overgaard cemetery last year were surprisingly absent. Was this being an El Nino year a factor? On the other hand, we re-collected 673368 [2014] near Eagar which had been lost, this year finding much larger plants and numerous mature tubers.

APA-GIL (Alpine) diverse *fendleri* target site. A bulk of nine *fendleri* accessions from the APA-GIL region of E Arizona and W New Mexico was recently shown to be the richest in AFLP markers of any in the USA (Bamberg et al., AJPR 93:564-571). We were able to test these populations individually to determine that a single population, PI 592415 = BAM 032 [1995], near Alpine, AZ, was the greatest contributor of genetic richness, so that location was targeted as the center of more intensive searching this year. In contrast to the situation for *jamesii*, it appeared to be an exceptional year and time for collecting *fendleri* in this area, since we were able to make new collections at 14 sites, about half of which had not been previously reported. The new site at Hulsey Lake was identified as far exceeding any other known in the region for numbers of very large, fruiting plants. Five years ago we identified the Santa Catalina mountains just NE of Tucson as a focus of genetic richness in southern AZ, then followed up with more intensive collecting and used AFLP to show that the prediction of capturing exceptional genetic richness in the Santa Catalinas was validated (Bamberg et al., AJPR 88:398-402). We now planned to repeat that exercise in the north, testing whether more intensive collecting around PI 592415 = BAM 032 [1995] at Alpine will similarly capture the expected much additional AFLP richness there.

Seeking a *fendleri* mega-population. In 2016 we published findings of a "mega-population" of *jamesii* at Mesa Verde, which as one gigantic population captures over 80% of all known AFLP markers for this species, and by

far the most private alleles. This year we pursued the goal of sampling a similar mega-population of *fendleri* on Mt Lemmon near Tucson.

Other searching. On the Mogollon Rim and around the Alpine target area, we stopped at 26 additional spots that were suggested from GoogleEarth or other maps, or simply looked like favorable habitat as we were driving by. During the drive from northern AZ/NM back to Tucson, we stopped at 8 additional known sites to document the condition of potatoes there.

## **2. Preparations:**

Permit from USFS for all NFs of the Southwest Region (see Permit section). Garmin GPSs borrowed from PEO, and uploaded tracks, waypoints and notes from DeLorme Topo 10 and GoogleEarth. We reviewed all known potato sightings and herbarium records (particularly from SEINET) and also scouted and marked promising new sites to explore in electronic maps before the trip. We navigated on roads mostly by laptop; recorded walking tracks, sites explored, and collection sites in the GPS. Some division of labor made collecting more efficient: AdR navigating; JB driving, taking GPS coordinates and tracks; IB taking collecting notes; CF collecting tubers, carrying and indexing tubers and fruit, extracting seeds and establishing plants at USPG. All took photos. As in previous years, GoogleEarth aerial photos were very helpful in showing the exact ground cover, aspect (steep and shaded NE preferred), and soil moisture potential of the micro-locations which are the small niches in which potatoes are most likely to appear within a general area. As in previous expeditions, the conclusion was again reinforced that models based on general eco-geo parameters are virtually useless for predicting the micro-habitats where potatoes may be found. To test practicality of sending cool shoots home overnight during an expedition, we tested the viability of rooted shoots from greenhouse and field after being stored moist in a 42F cooler for up to 10 days-- they stay remarkably fresh and viable.

## **3. Logistics:**

Travel was by air to Arizona, then we rented a Kia *Sorento* 4W drive vehicle which we drove a total of 1445 miles. We sent cool rooted shoots back to the genebank (overnight in ice-packed package), and also collected fruits and tubers as usual. All fruit were treated with 6.5 ml/L imidicloprid insecticide to kill fruit fly larva although fruit this year was unusually free of oviposit scars that indicate infestation.

## **4. Germplasm:**

*Solanum jamesii* and *S. stoloniferum* form *fendleri* were collected as tubers, seeds, and for three samples, plants shipped overnight to the genebank on ice. Populations were sampled from a total of 19 unique sites, with 4 of these sites having both species present. Re-collections to get better representation or resurrect previous samples that had been lost at the genebank were done for 6 samples. New germplasm collections were made in 20 cases, 12 of these being found new (i.e., not located previously in herbarium specimen records). Collections were given temporary codes (#) during the expedition, and assigned BdRF collector codes and PI numbers later.

## **5. Deposit of records, germplasm and files:**

US Potato Genebank, 4312 Hwy 42, Sturgeon Bay, WI, 54235. 920-743-5406. [john.bamberg@ars.usda.gov](mailto:john.bamberg@ars.usda.gov). Query GRIN text "BdRF". Detailed trip log, GPS track and Waypoints files, and additional photos and miscellaneous notes available from JB at USPG.

## **6. Claimed USPG trip expenses:**

JB=\$1870, IB=\$1500 (privately funded), AdR=\$2150, CF=\$1530, Total=\$7050 direct costs not counting salary or non-travel-associated costs. We thank K. Williams of PEO for \$7K funding.

## 7. Day by day Itinerary and Collections abstract:

Collections at sites are suffixed (J) for *jamesii* and (F) for *fendleri*. *Corrected mislabeled sp. 03-21-17.*

Sun18th: JB, IB and CF fly from GRB to MSP, meet AdR and continue to PHX. Rent 4WD *Sorento* from *National*, stop Fountain Hills for lunch, then to Payson to lodge at *America's Best Value Inn* (ABVI).

Mon19th: Meet 6AM *Beeline Cafe* for breakfast. Safeway for groceries and ice chest. Then N on 87 to Blue Ridge Reservoir. Access closed, but looked at E-facing steep slopes at entrance at E edge campsite *Rock Crossing*. Looked like possible habitat, but much cattle grazing. To 95-96 jct Bridge site, stopping at 95G site at 34.595644° x -111.170090°. E side bridge re-coll **95-96(F)#1**. To W side of bridge re-coll **95-96(J)#2**. At W side of bridge find new *fendleri* **95-96(F)#3**. Picnic lunch. Look at 34.540388° x -111.155251° on 96 along way to Knoll Lake. Habitat looked very good at N end below dam and especially along S shore of SW finger of lake in shady steep N-facing canyons and banks. To 300 E to 89 N to Bear Canyon Lake W shore, N parking lot to below dam and valley. Looked possible, but E-facing slopes not as steep and shady nor with mulchy ground cover as in places where potatoes found at nearby lakes. Return to Payson for *Safeway* deli supper and ABVI lodge. On 260 back to Payson, forest fire burning right up to guard rail.

Tues20th: Meet *Beeline Cafe* at 6:30 then *Safeway* for groceries and *PostNet* for styro shipping box. Then E on 260 to Tonto Creek. Whole valley to S full of smoke. Habitat appropriate, but low at 5400 ft. N about 0.6 miles to Horton campground where creeks cross. Looked very good with nightshades, boulders, huge firs. At 11AM back to Rim on 300 and N on 89 to Bear Canyon Lake middle parking lot. Bushwhack down steep narrow wooded canyon to lake (i.e., starting 34.401540° x -111.006282°). Looked very appropriate habitat. Back S to 300 Rim road, looking along way, e.g., corner of 89 and 89A, and campsite #101. Then E on 300 to N on primitive road 208 to S end of Bear Canyon Lake. Much mulch under large trees on N-facing slopes looked like excellent habitat. Picnic lunch. Back to 300 and Woods Canyon Lake. NW finger of lake trail to re-coll **WoodsNW(F)#4** as plants for test of shipping back to genebank overnight and many fruit. Back to Payson *Walmart* for 3 plastic sandwich boxes and cold packs. ABVI lodge.

Wed21st. Meet *Beeline Cafe* at 6:30. Check out ABVI. Mail package from *PostNet* with 95-96(F)#3 and WoodsNW(F)#4 plants to genebank. Leave 8:30 for Rim E on 260 and Canyon Creek site of Makins et al. [2012]. **Canyon Creek(J)#5, CanyonCreek(F)#6**. Look at jct 534 and 188 noting a few tiny J (not collected). Return to Woods Canyon Lake to camp store for lunch. Return to collection site #4 and continue on trail to W shore of N finger of lake for **WoodsN(F)#7**. To Heber site of BAM005 [1993] where J reliably growing whenever we have been in the area and stopped. None to be found this year. Continue to Heber-Overgaard Cemetery where J very abundant last year, to find they are rare this year. As at BAM005 site, nothing about 2016 conditions provides obvious explanation for very different status of populations visited at nearly same time last year. Lodge at *Buckskin Lodge* and supper at *Casa Ramos* in Heber.

Thu22nd. June's Café at Heber breakfast. To ShowLow and look at Fools Hollow Lake and revisit 2014 collection site near Bison Ridge Trail. More plants than 2 years ago. Then continue to McNary and E to Bog Creek site of Barr 238 [1961] for **Bog(F)#8**. Continue 260 to Eagar and re-collect **ColoRiver(J)#9**. Revisit J collection site from 2014 on S edge of Eagar town to observe only rare plants. *Safeway* for groceries and ice. Picnic in town. Reserve lodging at *Reed's Lodge*. Revisit site S of Eagar on Picnic Creek road, observed and collected many times as a robust population to find dry conditions and only a few small plants. Continue S on 180 past Nutrioso to FR56 E to Paddy Creek campground site of Manton 208 [2007] for **Manton(F)#10**. Here met camper Tucson botanist who advised *fendleri* can be found at Strayhorse Campground. Continue NE on

8056 attempting to go to site of Parker 7571 [1951] but road closed so retrace to look at Hulsey Lake for **Hulsey(F)#11**. Return Springerville and *Reed's Lodge*.

Fri23rd. Breakfast 6:30 at *Sapphire Grille*. S on 180 to Alpine and W on 180 to Luna Lake for **Luna(F)#12** and **Luna(J)#13**. Return W to Alpine and *Bear Wallow Cafe* for coffee break and planning. S on 191 and **CambellBlue(F)#14**. Retrace N on 191 to re-collect BAM032 [1995] = 592415, AFLP marker richness hotspot and motivation for extended exploration and collecting in this area for **BAM032(F)#15**. Continue S on 191 to look at mile 243 and mile 239. Rain. Continue S on 191 for lunch at Hannagan Meadow Lodge. Continue S to Blue Vista scenic lookout point for **BlueVista(F)#16**. Very cold and windy. Continue S on 191 to Strayhorse Campground for **StrayHorse(F)#17**. Light intermittent rain. Stop at Hannagan Meadow campground to look in rain. Very green. Return N on 191 to county line for **GreenleeLine(F)#18**. Return to Springerville to look at park W of 60 along Little Colorado River and then *Avery's Barbeque* and *Reed's Lodge*.

Sat24th. Frost. Breakfast at *Booga's* 6AM then S on 191 past Alpine to Beaverhead and W on FR26 for **Beaver(F)#19**. Continue W on 26 for **Beaver(J)#20** and **Beaver(J)#21**. N on FR574 to look at site of Caldwell 66263 [1966] but this may be wrong location, since no particularly favorable habitat exists here-- flat and dry under ponderosa stands, with much cattle grazing pressure. Return to FR26 and continue W to just SW of 26/574 jct at bridge over Willow Creek for **WillowCreek(J)#22**. Continue W on FR26 to 33.720449° x - 109.337460° where there is a pulloff and green valley to S which looked favorable. Continue W on FR26 and N on FR24 to road to Sprucedale and E for **Sprucedale(F)#23**. Continue E on Sprucedale road to guest ranch. Then retrace to FR24 and N to just before 276 jct to Buffalo Crossing recreational area for picnic lunch and searching. Some NW-facing cliffs along creek looked favorable. To 25/276 jct and W about 1/2 mile to bridge over creek to look at approximate site of Rickert 142 [1962]. Return to 276 and N about 1.5 miles to approximate site of Kearney 12450 [1935] where habitat looked very favorable. Looked at numerous spots along 14 miles of 276 between its S jct with FR24 and N jct with FR37. To about 1/4 mile NE past jct with FR37 for **FR276(F)#24**. Continue N on 276 to 81 and E on Three Forks Road. Look at jct FR8249 at very big culvert under road, which is about 4 miles W of Alpine. Return to Springerville and stay *Reed's Lodge*.

Sun25th. The goal for this day was mostly to accomplish the drive to Tucson (S on 191 to Alpine, E to New Mexico and S on 180 to Silver City and 90 to Deming and W on 10), taking opportunity to observe the condition of populations that could be visited with relatively little detour: E of Nelson Reservoir on FR2116 (PI 592413)-- none found; Jct Rts. 180/12 (PI 564050)-- only a few small J plants in grazed corner pasture. Mogollon (PI 564039)-- could not find any F; Catwalk at Glenwood (664008)-- abundant J in good condition near bridge over creek just as before; Rt90 mile marker 17 (564048)-- could not find J here. At Tucson, lodge at *Ramada Tucson East*.

Mon26th. Our goal in Tucson was to extensively sample to detect an F mega-population (Bamberg et al., AJPR 93:564-571) in the large population of F on the top of Mt Lemmon as observed in 2012. To Santa Catalina Mountains on Hitchcock Highway toward Summerhaven. Stop on way up at implausibly low (3900 ft.) Molino Basin Campground site of Hodgson 958 [1980]-- no F found. Stopped at Hitchcock campground (658184) to observe abundant F. Proceed to Mt Lemmon to pick one fruit from each of ~70 widely-dispersed plants along S-facing slope below trailhead for **LemmonTrail(F)#25**. Then W to Lemmon Meadow to collect one fruit from each of ~50 widely-dispersed plants in the flat grassy meadow among huge firs for **LemmonMeadow(F)#26**. Very windy and cold (45F). *Sawmill Restaurant* for lunch. Return to Tucson to lodge.

Tues27th. Drive to PHX, return car, fly to GRB, drive home.

## Tables. List of collections, general and detailed

Full narratives with location coordinates, habitat and plant descriptions, collection details and disposition are available in GRIN by query on individual PI number or the "BdRF" collector prefix. Also access GRIN for updates and eventual evaluation data on these stocks.

Temp coll	Temp coll	Temp coll	Sept date	BdRF	PI	site origin	plants	tubers	fruits	seeds
Place	#CODE	sp. Suffix								
95-96 bridge	1	F	19	322	679913	re-coll		0	6	80
95-96 bridge	2	J	19	323	679914	re-coll		2	0	0
95-96 bridge	3	F	19	324	679915	new	5	5	0	0
WoodsNW	4	F	20	325	679916	re-coll	8	0	89	4894
Canyon Creek	5	J	21	326	679917	Herb		32	0	0
Canyon Creek	6	F	21	327	679918	new		16	4	60
WoodsN	7	F	21	328	679919	new		4	0	0
Bog	8	F	22	329	679920	herb		0	12	375
ColoRiv	9	J	22	330	679921	re-coll		23	0	0
Manton	10	F	22	331	679922	herb		86	6	210
Hulsey	11	F	22	332	679923	new		0	132	7580
Luna	12	F	23	333	679924	herb		0	83	3519
Luna	13	J	23	334	679925	new		28	0	0
CambellBlue	14	F	23	335	679926	new		0	3	170
BAM032	15	F	23	336	679927	re-coll		0	49	3000
BlueVista	16	F	23	337	679928	herb		4	0	0
Strayhorse	17	F	23	338	679929	new		0	87	3595
GreenleeLine	18	F	23	339	679930	new		0	211	7740
Beaver	19	F	24	340	679931	new		0	38	1520
Beaver	20	J	24	341	679932	new		36	0	0
Beaver	21	J	24	342	679933	new		1	0	0
WillowCreek	22	J	24	343	679934	new		2	0	0
Sprucedale	23	F	24	344	679935	herb		0	29	395
FR276	24	F	24	345	679936	new		0	18	524
LemmonTrail	25	F	26	346	679937	re-coll		0	71	2840
LemmonMeadow	26	F	26	347	679938	re-coll		0	50	2000

Site: Found by herbspes record, known as re-collection, or new scouted *de novo* by habitat.

Plants: Did not arrive the next day because of a storm, and were no longer cool. Only half survived. It may be more effective to keep plants as cool as possible the whole trip and carry home on the plane.

## Concatenated provenance narratives

<p>PI 679913. BdRF 322. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Coconino County. Coconino National Forest. Near Pine. From Winslow SW on 87, then SE and S on FR95 to jct FR96 at S side of bridge, at parking lot &amp; recreational area. S banks of East Clear Creek E of bridge. At WSG 34.549627° x -111.162592° and 6540 ft. Coll #1. September 19, 2016. About 10 plants. Green, mature, with fruit. Under trees. Collected six fruit yielding 80 seeds.</p>
<p>PI 679914. BdRF 323. <i>S. jamesii</i>. United States. Arizona. Coconino County. Coconino National Forest. Near Pine. From Winslow SW on 87, then SE and S on FR95 to jct FR96 at S side of bridge, at parking lot &amp; recreational area. S banks of East Clear Creek W of bridge. At WSG 34.550364° x -111.164339° and 6540 ft. Coll #2. September 19, 2016. About 10-12 plants in one spot. Yellow. Under willow brush. Collected 2 tubers.</p>
<p>PI 679915. BdRF 324. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Coconino County. Coconino National Forest. Near Pine. From Winslow SW on 87, then SE and S on FR95 to jct FR96 at S side of bridge, at parking lot &amp; recreational area. S banks of East Clear Creek W of bridge. At WSG 34.550555 x -111.164122° and 6540 ft. Coll #3. September 19, 2016. About 20 small plants. Yellow. No flowers or fruit. Under willow brush. Collected 5 tubers and 5 plants.</p>
<p>PI 679916. BdRF 325. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Coconino County. Sitgreaves National Forest. Near Heber. Woods Canyon Lake. Approx. site of PI 673365 = BdRF 299 [2014]. From Heber SW on 260 then NW on Rim road. From parking lot NW of store, take trail along SW lake shore. Just beyond end of NW lake finger. Just above trail. At WSG 34.338556° x -110.955317° and 7520 ft. Coll. #4. September 20, 2016. Hundreds of plants, some to 24 inches, very green with many mature fruit, others small and yellow. Some with leaves completely blackened by apparent fungal disease. Steep N facing slope under large firs, fallen trees and rocks. Moist brown soil covered with needle duff. Collected 5 plants and 89 fruit yielding 4894 seeds.</p>
<p>PI 679917. BdRF 326. <i>S. jamesii</i>. United States. Arizona. Gila County. Tonto National Forest. Near Heber. Payson-Heber highway 260 going NE, at just past Willow Springs lake access turn S on Young highway 512. Under powerlines, then turn E on 33, then S on 534, then N on 188 to along W side of Canyon Creek. On E edge of road and to creek bottoms, as per Makins et al. 4027 [2012] but not within elk exclosure. At WSG 34.266825° x -110.799359° and 6360 ft. Coll #5. September 21, 2016. Scattered plants, small to 12", old, and without flowers or fruit but tubers mature. Open sun or in grass among branches of large fallen trees or under brush. Duff and moist sandy soil. Collected 32 tubers.</p>
<p>PI 679918. BdRF 327. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Gila County. Tonto National Forest. Near Heber. Payson-Heber highway 260 going NE, at just past Willow Springs lake access turn S on Young highway 512. Under powerlines and turn E on 33. S on 534. N on 188 along W side of Canyon Creek. On E edge of road and to creek bottoms, as per Makins et al. 4027 [2012] but not within elk exclosure. At WSG 34.267165° x -110.798808° and 6360 ft. Coll #6. September 21, 2016. Scattered plants, small, old, and without flowers but two fruit found. Open sun or in grass among branches of large fallen trees or under brush. Duff and moist sandy soil. Collected 16 tubers and 4 fruit yielding 60 seeds.</p>
<p>PI 679919. BdRF 328. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Coconino County. Sitgreaves National Forest. Near Heber. Woods Canyon Lake. From Heber SW on 260 then NW on Rim road. From parking lot NW of store, take trail along SW lakeshore, cross creek and continue to W shore of N lake finger. At WSG 34.342258° x -110.952519° and 7520 ft. Coll. #7. September 21, 2016. Only a few small yellowed plants. No flowers or fruit but tiny mature tubers. In trail among rocks and needle mulch. Collected 4 tubers.</p>

<p>PI 679920. BdRF 329. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Apache County. Sitgreaves National Forest. Near McNary. From McNary E on 260 to Bog Creek. Roadside at culvert. E and W ditch on S side of 260. Site of RJ Barr 238 [1961]. At WSG 34.053720° x -109.754046° and 7690 ft. Coll #8. September 22, 2016. About 20 plants, small and old to 4 inches. No flowers, but fruit without fruitfly scars. Open sun in dry, gravelly soil. Collected 12 fruit yielding 375 seeds.</p>
<p>PI 679921. BdRF 330. <i>S. jamesii</i>. United States. Arizona. Apache County. Sitgreaves National Forest. Near Eagar. W of Eagar at 261. S to first driveway on E and back N to banks of Little Colorado River. Site of BdRF 302 [2014] = PI 673368 (lost). About 50 ft from bridge on W edge of primitive road. At WSG 34.103735° x -109.343134° and 7140 ft. Coll #9. September 22, 2016. About 30 plants in a 12 foot radius to 15 inches tall. Yellow without flowers or fruit but many large mature tubers. Sandy soil under willow brush. Collected 23 tubers.</p>
<p>PI 679922. BdRF 331. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Apache County. Apache National Forest. Near Nutrioso. From Nutrioso S on 191 and NE on FR56. Campground at Paddy Creek. Site of Manton 208 [2007]. At WSG 33.917540° x -109.162042° and 8340 ft. Coll #10. September 22, 2016. Many scattered small older plants. Inside circle loop under Ponderosa, a cluster of many small seedlings apparently from a single fruit produced many mature tubers. And S of loop under alders, ~10 large green plants with mature fruit. Open or under trees, on sides of ditches among tree branches. In sandy soil under needle duff. Collected 86 tubers and 6 fruit yielding 210 seeds.</p>
<p>PI 679923. BdRF 332. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Apache County. Apache National Forest. Near Nutrioso. From Nutrioso S on 191 and NE on FR56, continuing on FR8056. Hulsey Lake. From parking lot down N toward rock jetty. At WSG 33.932199° x -109.160205 and 8865 ft. Coll #11. September 22, 2016. Many thousands of plants to 24 inches, with very large leaves and many very large mature fruit. N facing slope of S shore. Under fallen branches and duff in moist dark soil. Among ferns. Collected 132 fruit yielding 7580 seeds.</p>
<p>PI 679924. BdRF 333. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Apache County. Apache National Forest. Near Alpine. E from Alpine to Luna lake. Luna lake at San Francisco river. Approximate site of Ricketson 4281 [1988]. At WSG 33.827864° x -109.081933° and 7940 ft. Coll #12. September 23, 2016. Thousands of small, older plants but some green to 10 inches with fruit. Around and below Luna Lake spillway and on knoll to E of lake. In needle mulch under scattered trees or in open among rocks and fallen logs. Mature fruit. Observed three Colorado potato beetles feeding here. Collected 83 fruit yielding 3519 seeds.</p>
<p>PI 679925. BdRF 334. <i>S. jamesii</i>. United States. Arizona. Apache County. Apache National Forest. Near Alpine. E from Alpine to Luna lake. Luna lake at San Francisco river near spillway about 50 N of cattle guard on S-facing slope. At WSG 33.828194° x -109.081356° and 7909 ft. Coll #13. September 23, 2016. About 15 older plants to 6 inches without flowers or fruit. In open slope but hiding among branches of fallen tree. Collected 28 tubers.</p>
<p>PI 679926. BdRF 335. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Greenlee County. Apache National Forest. Near Alpine. From Alpine S on 191. Cambell Blue Wash. At WSG 33.746151° x -109.205766° and 7770 ft. Coll. #14. September 23, 2016. Rare. Only about 10 plants to 6 inches in one spot. Older, with mature fruit. N facing slope high above 191. Beside fallen, burned tree bole. Among grass and needle mulch. Brown moist soil. Collected 3 fruit yielding 170 seeds.</p>

<p>PI 679927. BdRF 336. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Apache county. Apache National Forest. Near Alpine. From Alpine S on 191. Site of PI 592415 Bam 032 [1995]. Slope on W side of 191 across from roadside pulloff. Less than 25 feet from road at culvert SW of pulloff. At WSG 33.788199° x -109.169033° and 8150 ft. Coll. #15. September 23, 2016. About 15 plants to 18 inches, one plant flowering, some with &gt; 20 fruit on a single plant. In needle mulch over moist black soil mostly in open. Collected 49 mature fruit yielding 3000 seeds.</p>
<p>PI 679928. BdRF 337. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Greenlee County. Apache National Forest. Near Alpine. From Alpine S on 191. Highest, most S point near end of path to Blue Vista lookout point. On E side of path. A few inaccessible plants seen in cliffs to E and W. At WSG 33.564613° x -109.353476° and 9185 ft. Coll #16. September 23, 2016. About 20 green plants to 12 inches. No flowers or fruit. E facing slope in thick leaf mulch over moist, very black soil under shade of scrub oak. Collected 4 tubers.</p>
<p>PI 679929. BdRF 338. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Greenlee County. Apache National Forest. Near Alpine. From Hannagan Meadow S on 191. At Strayhorse Campground, both sides of road. At WSG 33.549892° x -109.317522° and 7780 ft. Coll #17. September 23, 2016. Many, very widespread and variable plants from small yellow to large and green with fruit. In groups and scattered singles. Under trees in very mulchy soil (like sawdust) to open slopes above creek in duff. Under oak scrub in seepage below water tank. Sometimes insect damage. Collected 87 fruit yielding 3595 seeds.</p>
<p>PI 679930. BdRF 339. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Apache County. Apache National Forest. Near Alpine. From Alpine S on 191 to Greenlee County line. In gravel edge of E side of 191 from Greenlee line to next driveway to N (about 500 ft). At WSG 33.778413° x -109.183430° and 7960 ft. Coll #18. September 23, 2016. Many robust, mature plants to 8 inches with many mature fruit. Open gravel roadside and among thorny brush on E-facing slopes down to Coleman Creek. Collected 211 fruit yielding 7740 seeds.</p>
<p>PI 679931. BdRF 340. <i>S. stoloniferum</i> form <i>fendleri</i>. United States. Arizona. Greenlee County. Apache National Forest. Near Alpine. From Alpine S on 191 to FR26 Beaverhead road. About 2 miles W on FR26 at culvert, within 10 ft of road, both sides. At WSG 33.714689° x -109.258810° and 7760 ft. Coll #19. September 24, 2016. Many plants to 8 inches, dark green, frosted, commonly with mature large fruits which also looked frozen. Open gravel and rock roadside with some grass. Collected 38 fruit yielding 1520 seeds.</p>
<p>PI 679932. BdRF 341. <i>S. jamesii</i>. United States. Arizona. Greenlee County. Apache National Forest. Near Alpine. From Alpine S on 191 to FR26 Beaverhead road. About 4 miles W on FR26 and 200 ft west of bridge over creek. At WSG 33.720128° x -109.276243° and 7700 ft. Coll #20. September 24, 2016. About 20 frosted, yellow plants to 10 inches tall with no flowers or fruit. In open SW-facing side of artificial gravel berm built up as a driveway. Collected 36 tubers.</p>
<p>PI 679933. BdRF 342. <i>S. jamesii</i>. United States. Arizona. Greenlee County. Apache National Forest. Near Alpine. From Alpine S on 191 to FR26 Beaverhead road. About 4 miles W on FR26 and 200 ft west of bridge over creek. At WSG 33.720128° x -109.276243° and 7700 ft. Coll #21. September 24, 2016. Two small plants with no flowers or fruit. A few more scattered plants in burned, open pine flats between road and creek. In open SW-facing side of artificial gravel berm built up as a driveway and moist brown soil toward creek. Collected 1 tuber.</p>
<p>PI 679934. BdRF 343. <i>S. jamesii</i>. United States. Arizona. Greenlee County. Apache National Forest. Near Alpine. From Alpine S on 191 to FR26 Beaverhead road. Just SW of 574 jct on 26 at bridge over Willow Creek. At WSG 33.713167° x -109.283443° and 7770 ft. Coll #22. September 24, 2016. One plant 7 inches tall with no flowers or fruit. Under huge Ponderosa. Collected 2 tubers.</p>



PI 679935. BdRF 344. *S. stoloniferum* form *fendleri*. United States. Arizona. Greenlee County. Apache National Forest. Near Alpine. From Alpine S on 191, W on FR26 Beaverhead road, N on FR24, E on FR565 toward Sprucedale Ranch. About 0.2 miles NE on 565 hairpin curve where road crosses creek, also S another ~0.10 mile to where cable car crosses creek. S edge of road steep down to flat, about 30 ft. Approx site of Parker 7652 [1951]. At WSG 33.738497° x -109.341726° and 7520 ft. Coll #23. September 24, 2016. Scattered small plants among rocks facing W near bridge. By cable car, under pines, about 10 plants to 15 inches, quite green but frosted, with mature fruit. Moist brown soil in needle mulch among grass and rocks under trees. Collected 29 fruit yielding 395 seeds.

PI 679936. BdRF 345. *S. stoloniferum* form *fendleri*. United States. Arizona. Apache County. Apache National Forest. Near Alpine. From Alpine S on 191, W on FR26 Beaverhead road, N on FR24, N on FR276 (or from Alpine W on FR249 and S on FR81/FR276). Between two cattle guards, between mile markers 4&5 on FR276, W side of road. At WSG 33.823468° x -109.277287° and 8565 ft. Coll #24. September 24, 2016. About 20 plants to 15 inches tall, green with mature fruit. E facing high slope among burned Ponderosas in needle much. Only in hollow made by a single large upturned stump, in moist dark soil, protected by brush and branches from otherwise heavy cattle grazing. Collected 18 fruit yielding 524 seeds.

PI 679937. BdRF 346. *S. stoloniferum* form *fendleri*. United States. Arizona. Pima County. Santa Catalina Mountains. Near Tucson. From Tucson to Summerhaven on General Hitchcock highway and Mt. Lemmon trailhead on Ski Run road. Below parking lot across a 1,000 ft E-W transect of steep S-facing slope. At WSG 32.440239° x -110.785289° and 9085 ft. Coll #25. September 26, 2016. Many widely scattered plants of various sizes, often with mature fruit among rocks and fallen logs. Steep, open, high rocky S-facing slope. Collected 71 fruit, one from each dispersed plant, estimated 2840 seeds.

PI 679938. BdRF 347. *S. stoloniferum* form *fendleri*. United States. Arizona. Pima County. Santa Catalina Mountains. Near Tucson. From Tucson to Summerhaven on General Hitchcock highway and Ski Run road to trailhead to Lemmon Meadow. At Lemmon Meadow site of Harlan 111 [2000], previous Bamberg collections, Hungry "Seeds of Time" film site. At WSG 32.438101° x -110.792865° and 9090 ft. Coll #26. September 26, 2016. Very many widely scattered plants of various sizes, often quite green with mature fruit. High flat alpine meadow. Among fallen logs in grass and under large firs and associated SE facing slope. Collected 50 fruit, one from each dispersed plant, estimated 2000 seeds.

## 8. Additional and more intensive future exploration possibilities in this area

- a. Finding more *fendleri* populations on the Mogollon Rim would expand representation at this new NW extreme of the range.
- b. Discovery of the gigantic population of *fendleri* at Hulsey Lake, only 10 miles N of the diversity hot-spot at site of PI 592415 = Bam 032 [1995] draws attention to it for further study and sampling as a possible mega-population of diversity. Not many sites have been reported around Escudilla Mountain E of Nutrioso.
- c. If these new collections around BAM032 hotspot prove to be very genetically rich, even more exploration might be warranted. At least two recently reported spots, Springer 5610 [2012] and Sturgill 5607 [2012] which are very close together and about 3.5 miles due S of Nutrioso could be searched.
- d. We have only one sample of *fendleri* along 15 N of Silver City to Gila Cliff dwellings area-- more representation of that area is warranted, especially considering the recent idea that ancient native peoples may have used and moved potatoes of the area more than previously assumed. A new site has been reported along Signal Peak Road.
- e. There are four old herbarium records of *fendleri* near Datil, Socorro, Corona, New Mexico which represent the NE extreme of the reported range, at least 50 miles farther N than any site we have sampled for germplasm. Samples from these areas would broaden geographic representation and possibly capture new genetics.

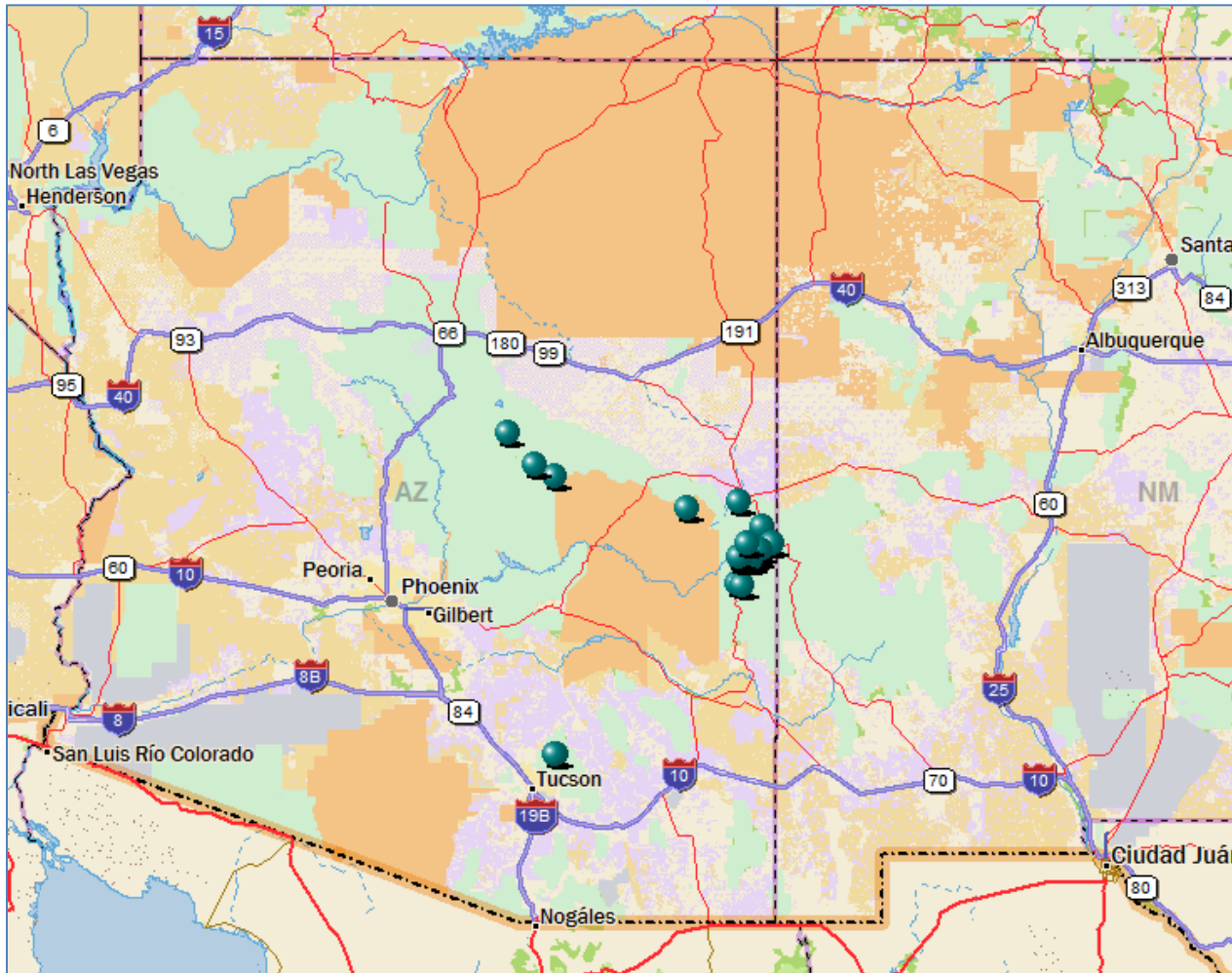
## 9. Permit

**From:** Parker, Angela D -FS  
**Sent:** Friday, July 15, 2016 4:17 PM  
**To:** Bamberg, John <[John.Bamberg@ARS.USDA.GOV](mailto:John.Bamberg@ARS.USDA.GOV)>  
**Cc:** Kennedy, Kathryn L -FS <[kathrynlkennedy@fs.fed.us](mailto:kathrynlkennedy@fs.fed.us)>  
**Subject:** Potato Genetic Collection in the Southwest Region

John Bamberg and his associated researchers from the USDA/ARS - U. S. Potato Genebank are allowed to collect wild potatoes on National Forest lands within the Southwest Region as a "within-USDA "cooperating agents. If you have any additional questions you may contact Kathryn Kennedy, Regional Botanist p: 505-842-3263 ; c: 314-302-3760: [kathrynlkennedy@fs.fed.us](mailto:kathrynlkennedy@fs.fed.us) or Angela Parker, Southwest Contracting Officer; p: 505-842-3888 c: 505-999-0660 ; [adparker@fs.fed.us](mailto:adparker@fs.fed.us)

## 10. Photos and maps of locations, habitats, and plants

### General Area Map with sites of 26 collections



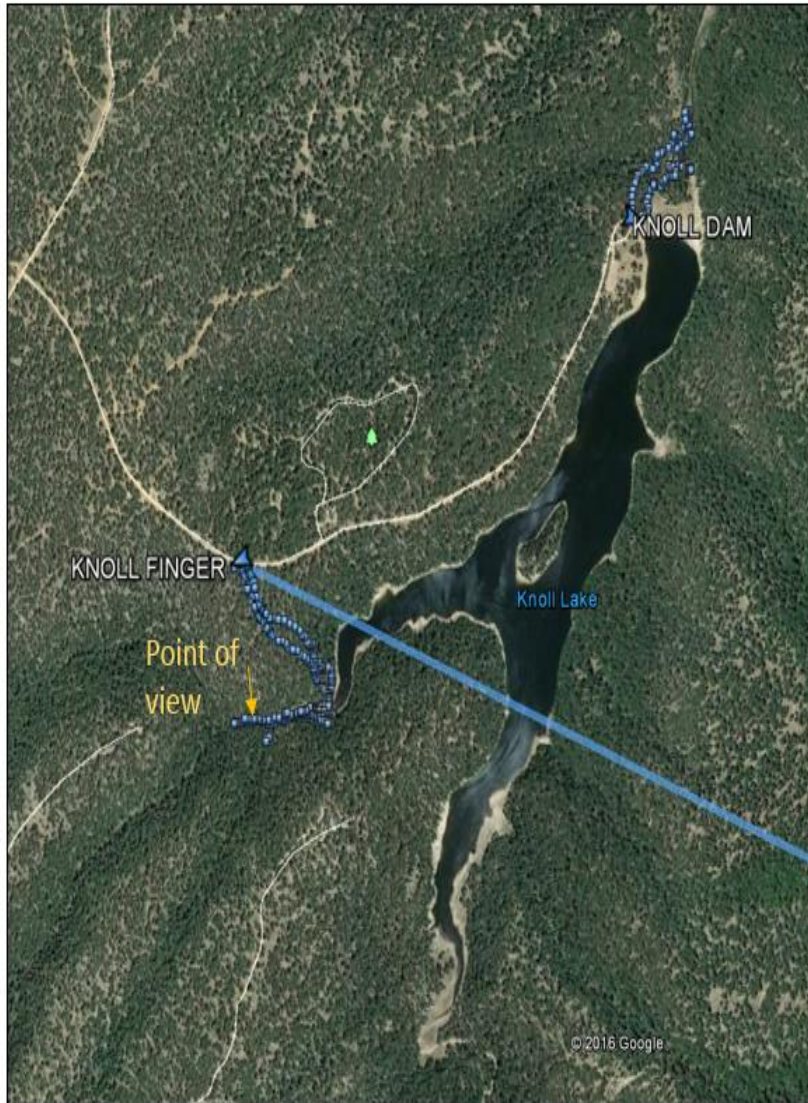


## 95-96 bridge #1(F), #2(J), #3(F)





# Knoll Lake (none found)

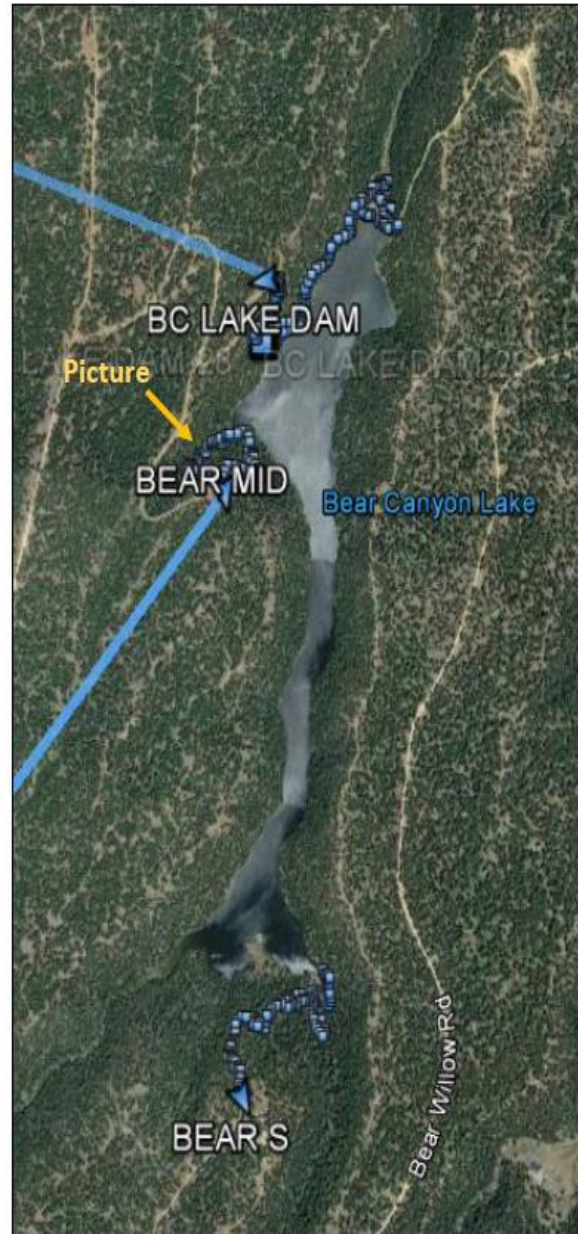
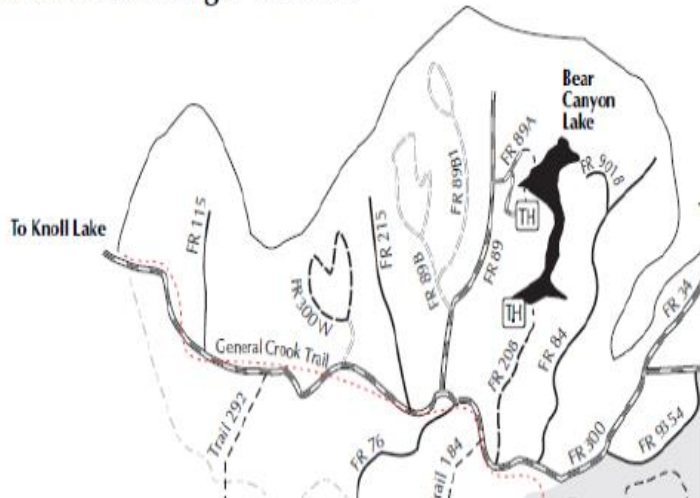




# Bear Canyon Lake

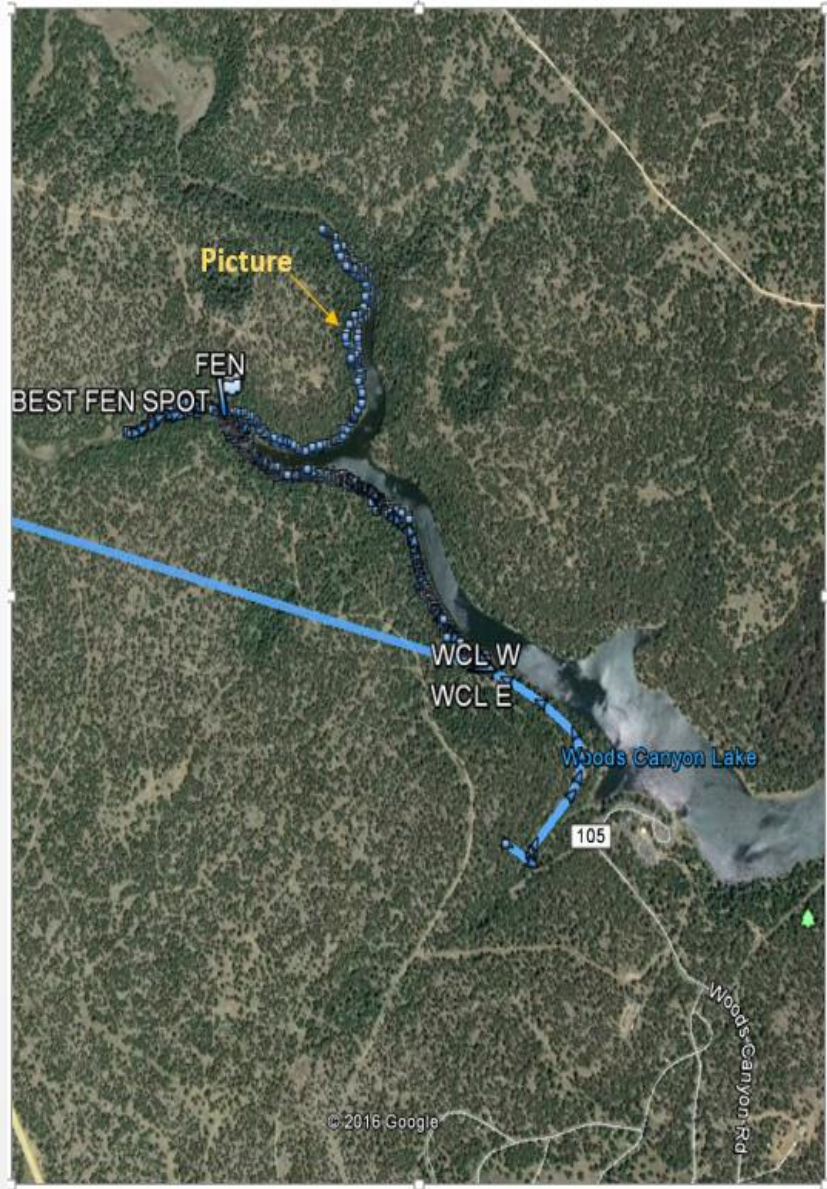
(none found)

**Rim Lakes Recreation Area**  
Apache-Sitgreaves National Forests  
Black Mesa Ranger District



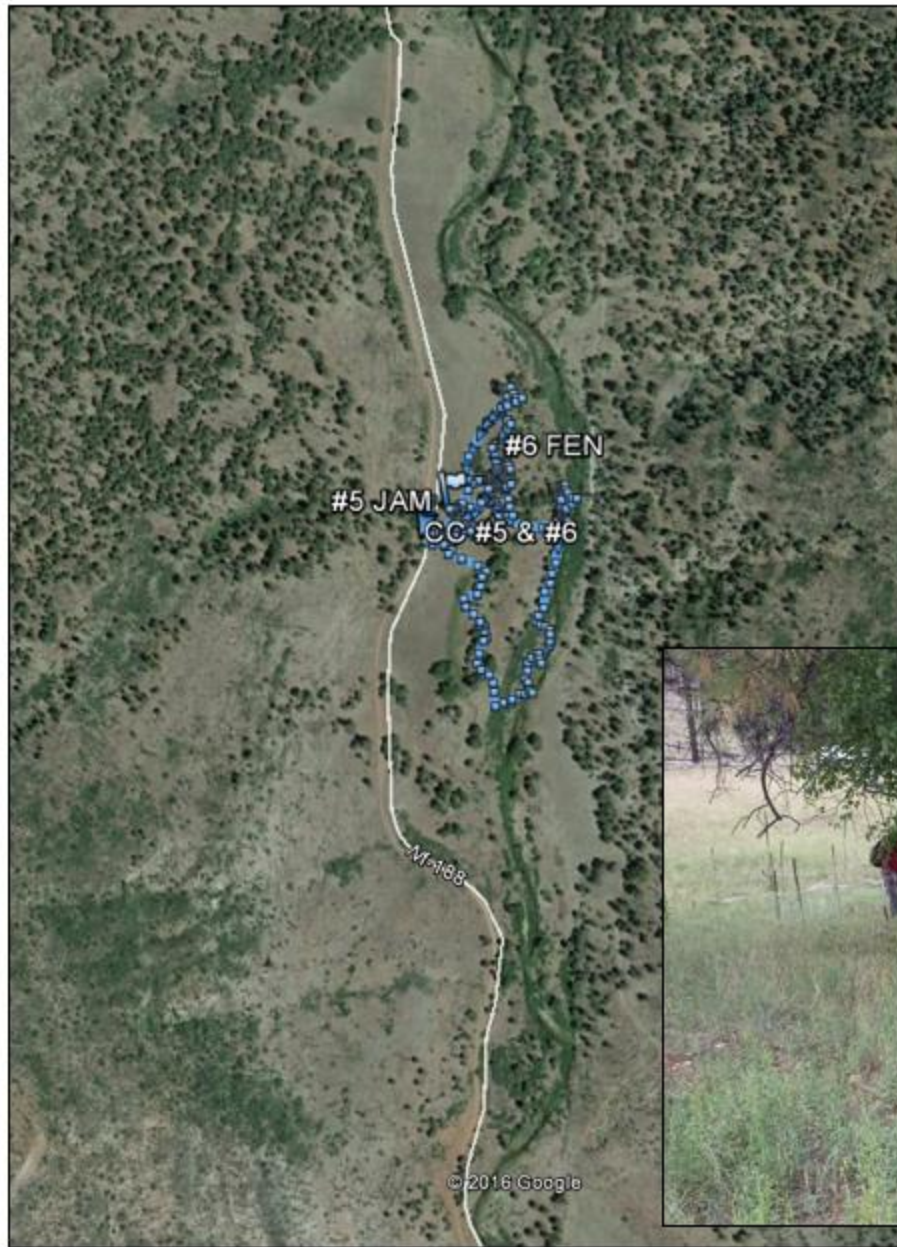


# Woods Canyon Lake NW#4 (F) and N#7 (F)





## Canyon Creek #5(J), #6(F)

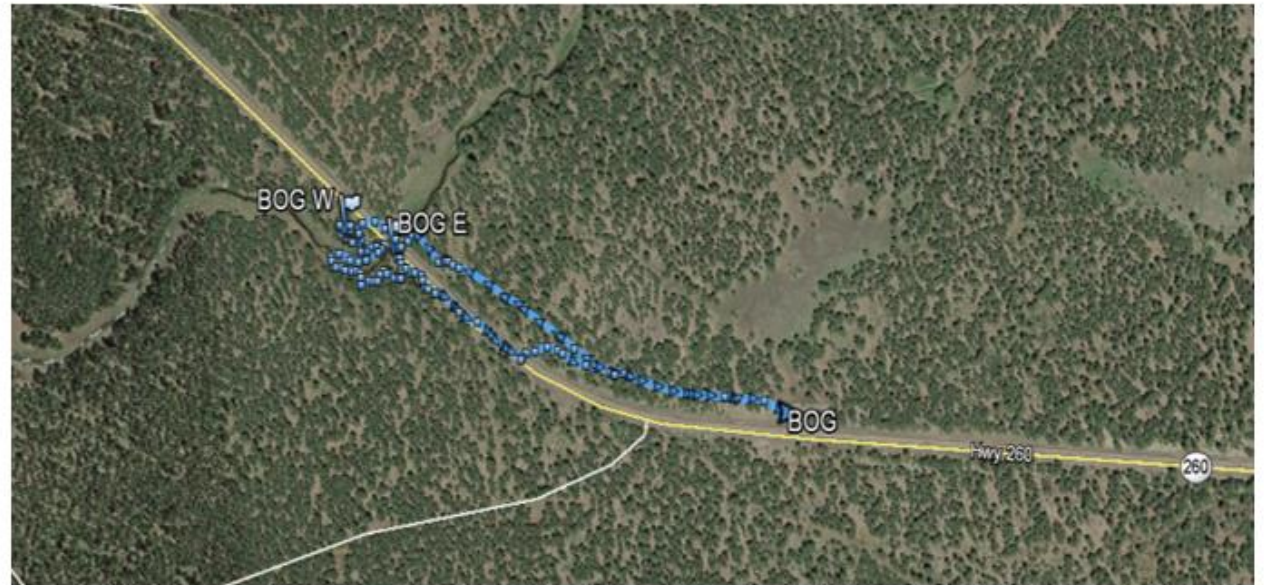


**Both species along E  
edge of road under tree**





## Bog Creek #8(F)



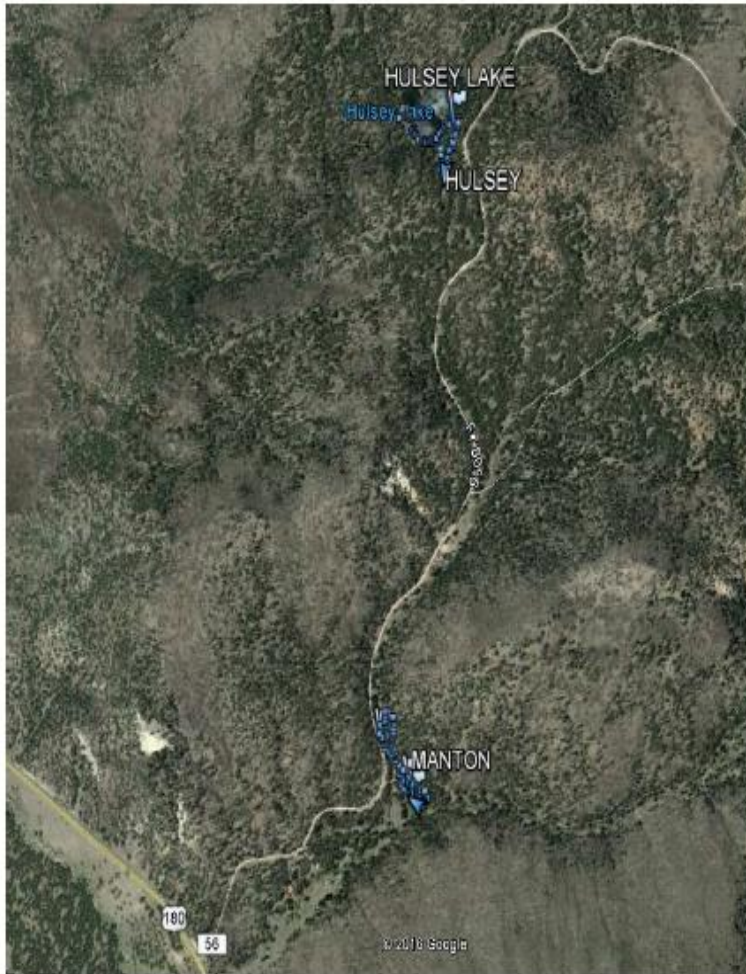


## ColoRiv #9(J)





# Manton #10(F) and Hulsey Lake #11(F)



Alpine, AZ



Manton habitat



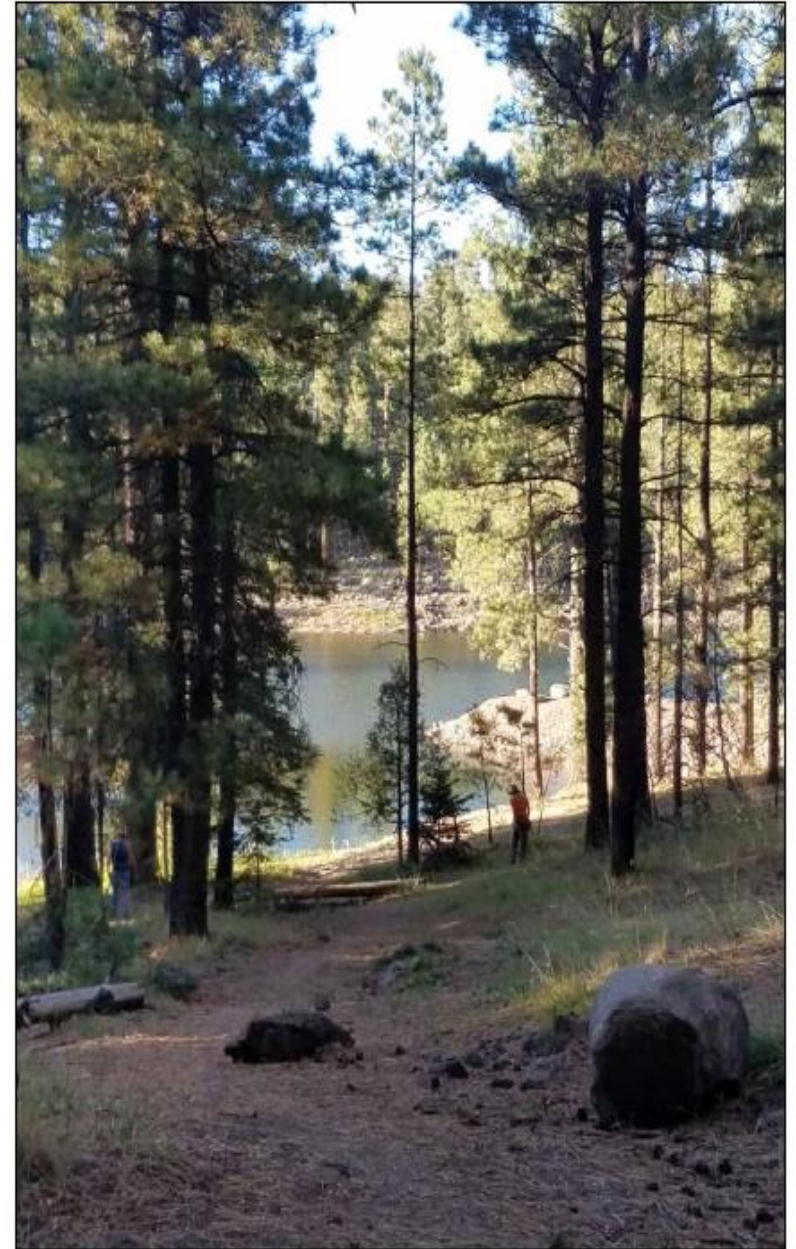
Many seedlings in one clump with tubers





Hulsey Lake large plants with fruit

Hulsey Lake habitat (S shore) →





## Luna Lake #12(F), #13(J)



F in spillway and in upland woods

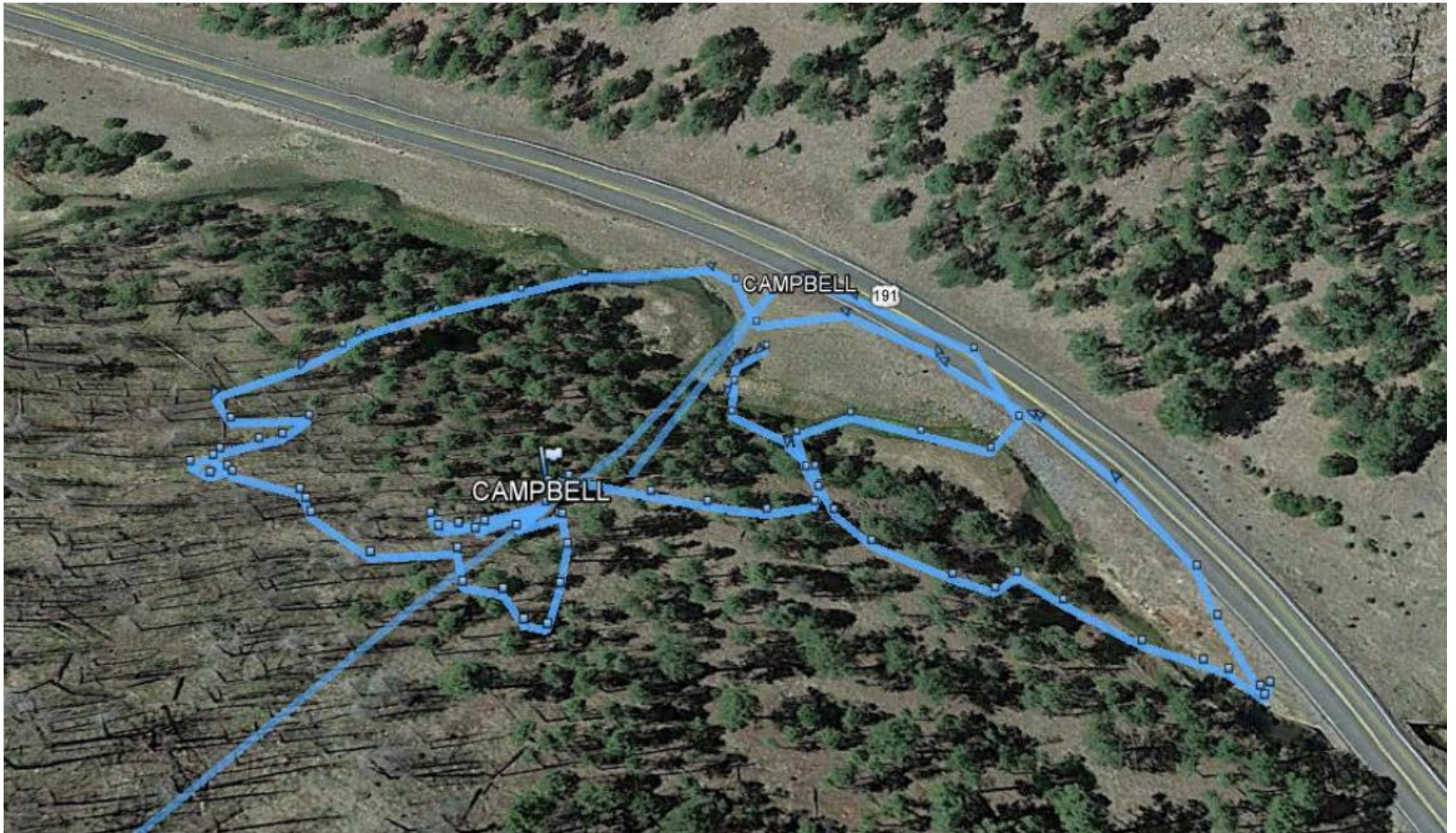


J in one rotted log



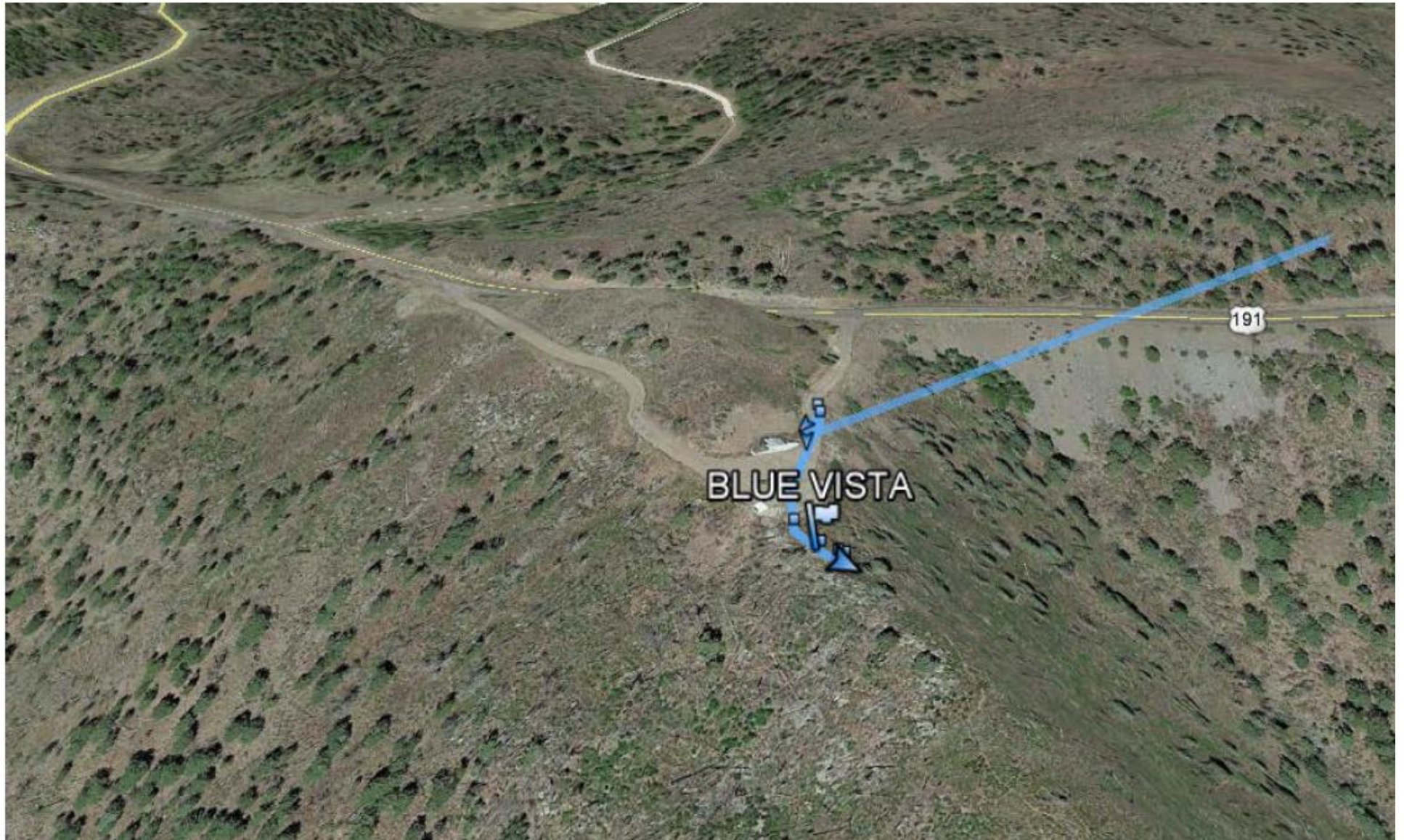


## CambellBlue #14(F)

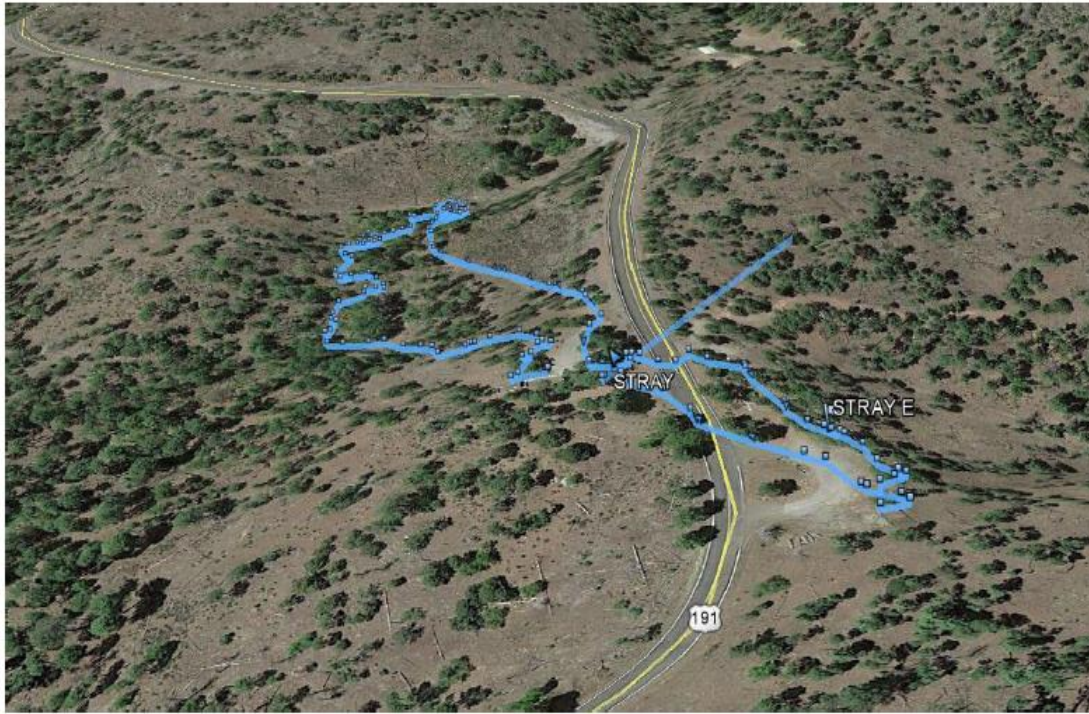




## Blue Vista #16(F)





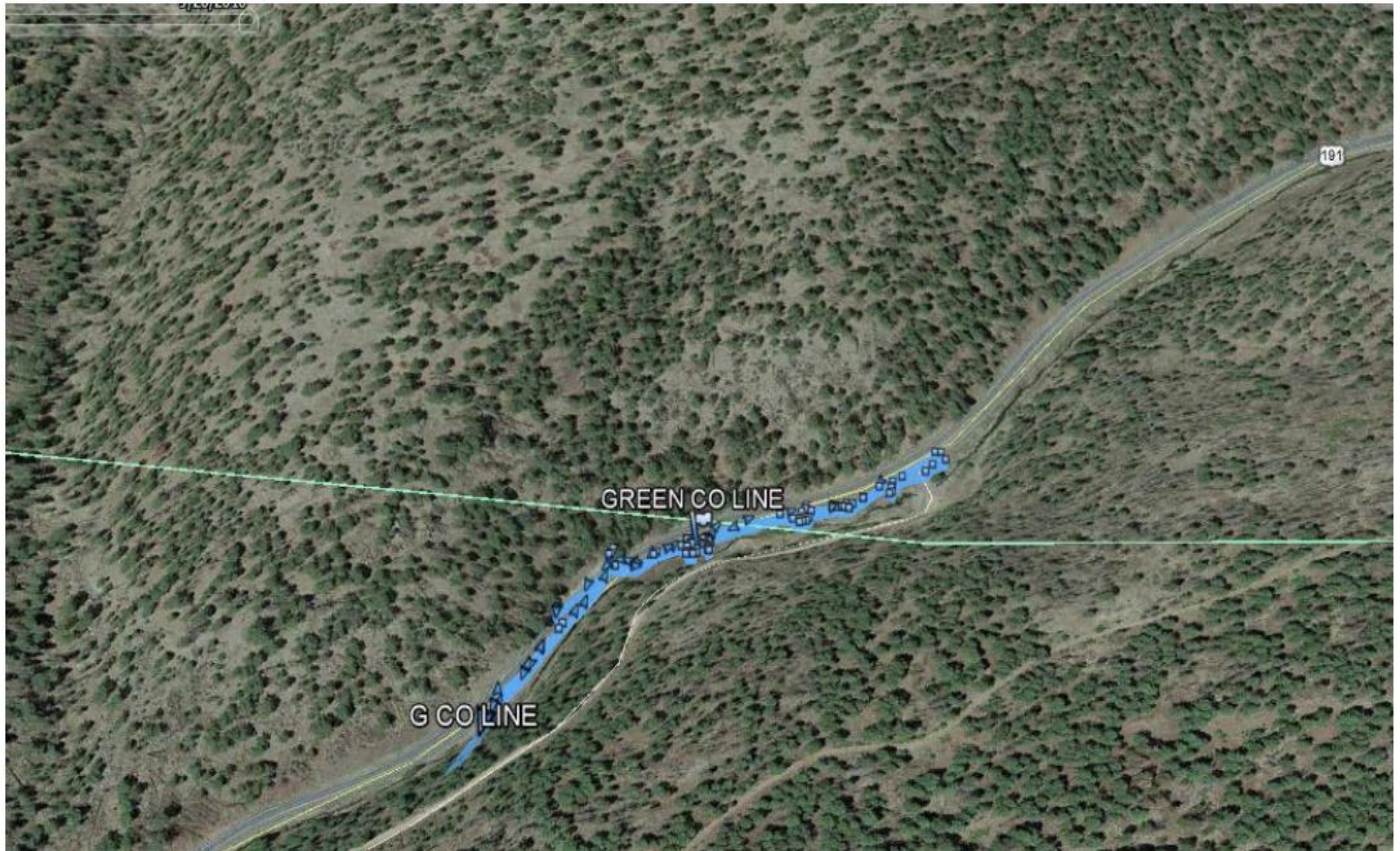


Strayhorse #17(F)





# GreenleeLine #18(F)



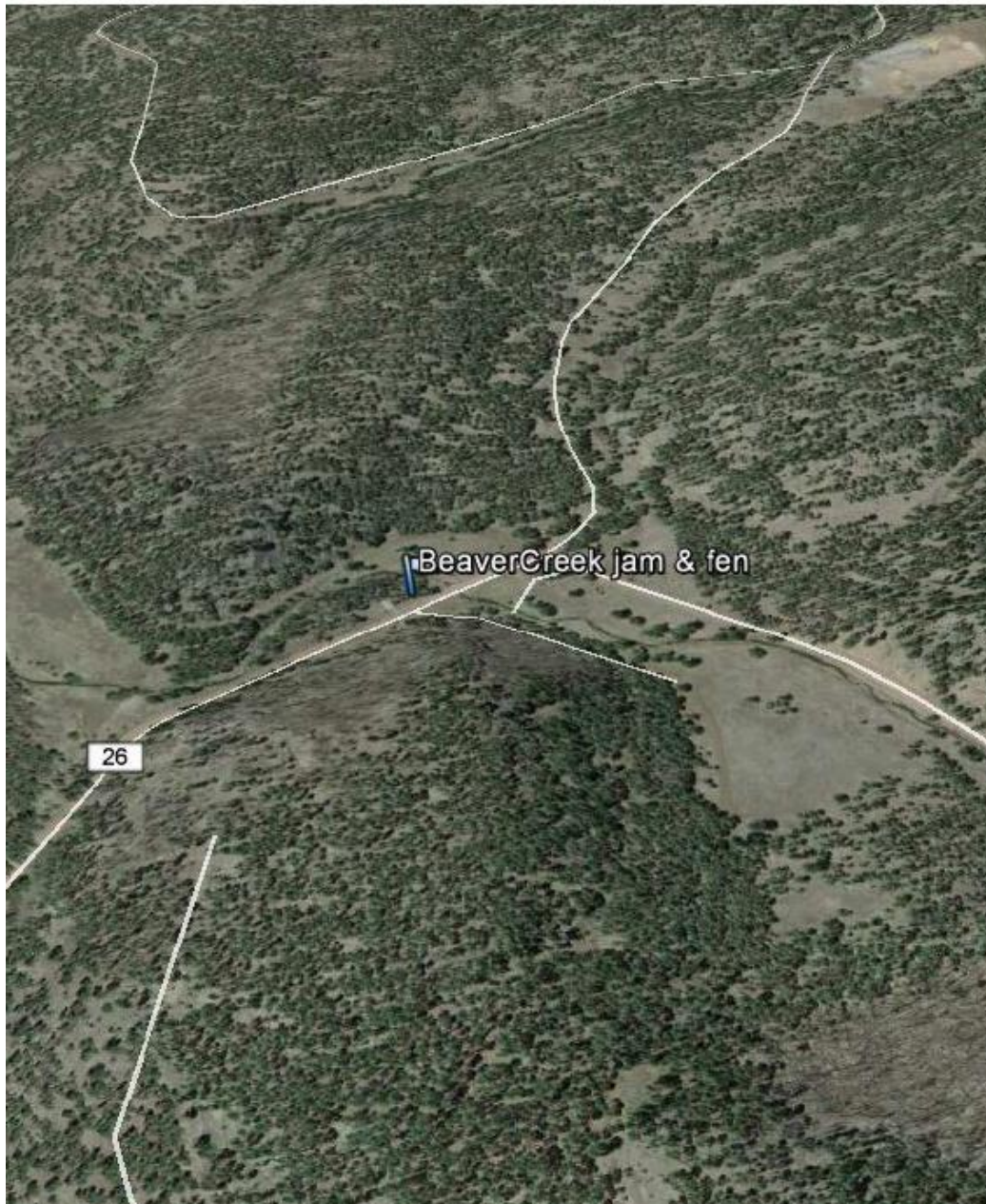


## Beaver #19(F)





## Beaver #20(J) and #21( J)



frosted J



## Willow Creek #22(J)





# Sprucedale #23(F)





# FR276 #24(F)





CF at Catwalk near Glenwood, NM (previous observed J site not collected)





## Lemmon #25 (F) and #26(F)



Lemmon Meadow #26(F) habitat